Headquarters U.S. Air Force

Integrity - Service - Excellence

Assessment of Human Systems Integration in Air Force Acquisition

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NDIA Systems Engineering Conference
San Diego CA
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Overview

- Air Force HSI Office (AFHSIO)
- Summary of Previous Work
- Current Effort
- Closing Comments

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AFHSIO Objectives

- Integrate HSI into functional domains
  - Into the AT&L life cycle management framework
  - Build AF team to equip, enhance, sustain the warfighter
- Institutionalize HSI as a way of doing business
  - Increase total system performance
  - Decrease total ownership costs
- Sustain HSI in systems acquisition
  - Collaboration w/ OSD, Sister Services, Industry and Academia
  - Improve support to programs
- Improve HSI
  - Feedback and lessons learned from the operational, logistics and acquisition communities
  - Demonstrate value added to the Air Force

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AFHSIO's Role in Meeting HSI Objectives

- Facilitate and advocate integration of HSI into the Integrated Life Cycle Management (ILCM) framework and AF policies and guidance to comprehensively implement, assess, and improve HSI
- Develop and deliver comprehensive HSI education and training, tools, technology and methods to support Program Executive Officers (PEO), Program Managers (PM), Systems Engineers, and others involved in requirements development, acquisition and sustainment
- Provide expert advice, real-time assistance, and implementation strategies of HSI
- Support the development, communication and implementation of HSI initiatives

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Summary of Previous Work

- **Objective: Integrate HSI considerations and processes into the Acquisition, Technology and Logistics Life Cycle Management Framework to equip and sustain Airmen**
- **Develop a product to:**
  - **Facilitate systems engineers' understanding of what HSI domain experts bring to the table**
  - **Help HSI domain experts understand their role in the acquisition process**
  - **Assist domain and systems engineering integration on HSI issues**

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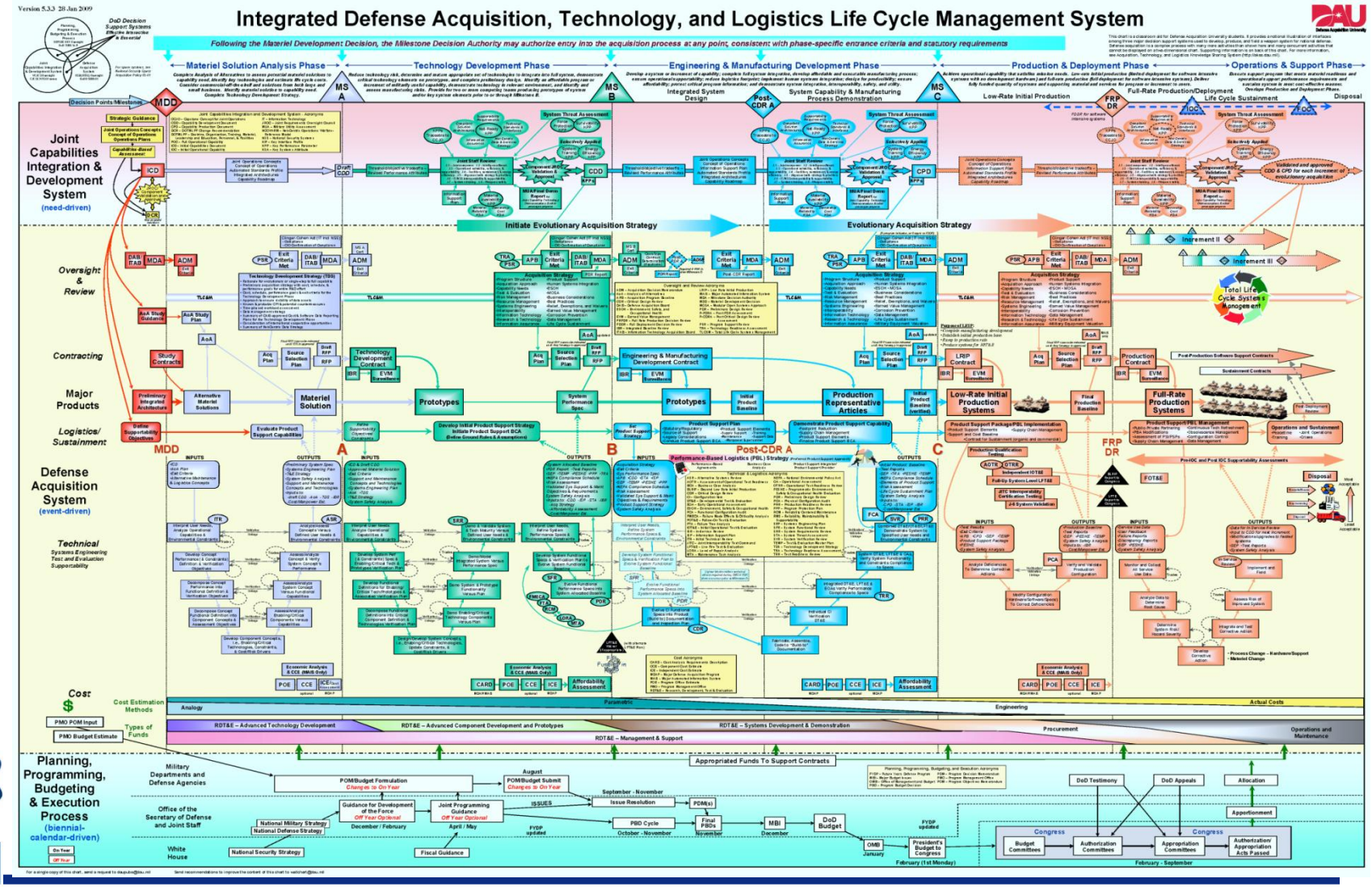
Take this…



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…and this…

1. Manpower
2. Personnel
3. Training
4. Environment
5. Safety
6. Occupational Health
7. Human Factors
8. Survivability
9. Habitability

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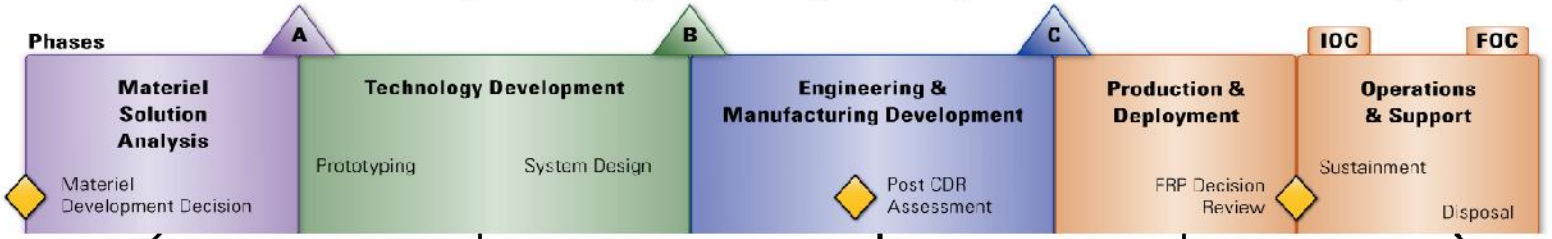
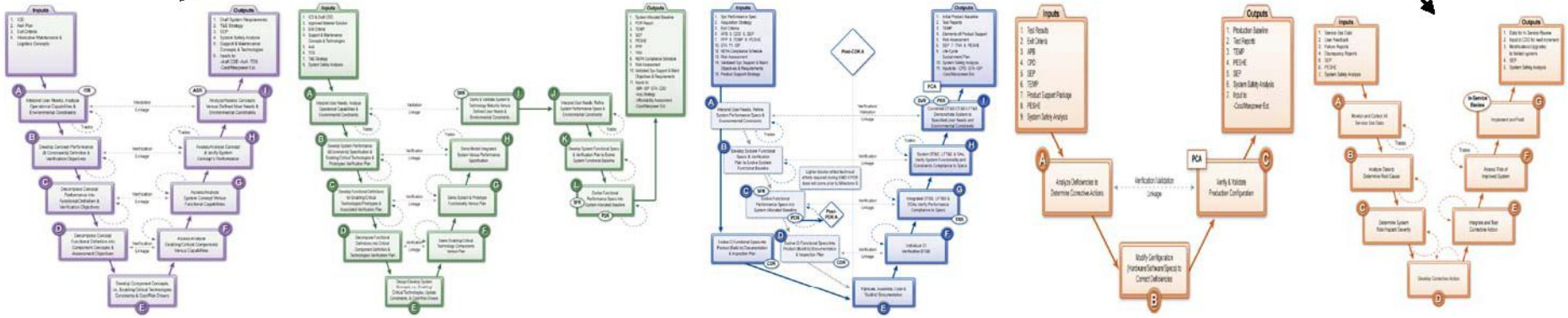
…and do this!

Acquisition Life Cycle and Systems Engineering Technical Review Timing





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Current Effort

- Direct application of previous HSI in Acquisition effort.
- Develop framework for identifying HSI related risks – process and product assessment. Examine in greater detail Air Force acquisition processes for life cycle management, systems engineering, and test and evaluation.
- Develop templates to aid in the implementation and subsequent assessment of HSI considerations in the acquisition and sustainment processes.
  - Air Force Life Cycle Management Plan (LCMP).
  - Systems Engineering Plan (SEP).
  - Test and Evaluation Strategy / Test and Evaluation Master Plan (TES / TEMP).
- Tie information to an executive dashboard – Status Board.

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Current Effort (continued)

- Carried out in conjunction and collaboration with the Air Force Research Laboratory's 711th Human Performance Wing
  - Investigate program management, systems engineering, and test and evaluation processes, policies, and guidance
  - Provide recommendations for inserting HSI language into these processes, policies, and guidance
  - HSI life cycle planning and execution integrated with three major acquisition domains
    - Program management – LCMP – life cycle program planning and execution
    - Systems engineering – SEP – life cycle system design and development
    - Test and Evaluation (T&E) – TES / TEMP – life cycle verification and validation

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AF Life Cycle Management Plan

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- **Document Purpose: The Life Cycle Management Plan (LCMP) is the integrated acquisition and sustainment strategy for the life of a system.**

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LCMP Template Screen Shot

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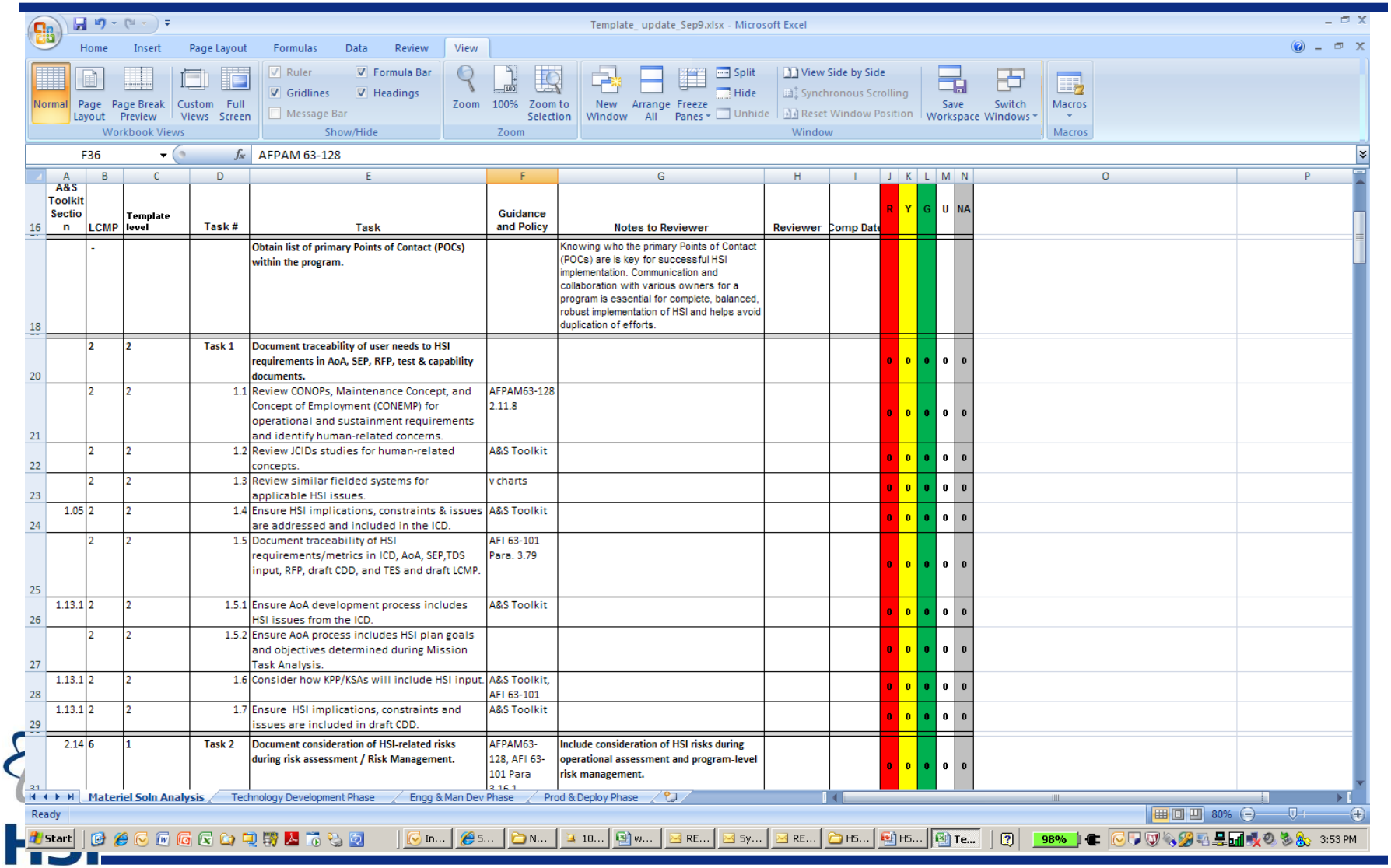

	A&S Toolkit Section	LCMP	Template level	Task #	Task	Guidance and Policy	Notes to Reviewer	Reviewer	Comp Date	R	Y	G	U	NA
18		-			**Obtain list of primary Points of Contact (POCs) within the program.**		Knowing who the primary Points of Contact (POCs) are is key for successful HSI implementation. Communication and collaboration with various owners for a program is essential for complete, balanced, robust implementation of HSI and helps avoid duplication of efforts.							
20		**2**	**2**	**Task 1**	**Document traceability of user needs to HSI requirements in AoA, SEP, RFP, test & capability documents.**					**0**	**0**	**0**	**0**	**0**
21		2	2	1.1	Review CONOPs, Maintenance Concept, and Concept of Employment (CONEMP) for operational and sustainment requirements and identify human-related concerns.	AFPAM63-128 2.11.8				0	0	0	0	0
22		2	2	1.2	Review JCIDs studies for human-related concepts.	A&S Toolkit				0	0	0	0	0
23		2	2	1.3	Review similar fielded systems for applicable HSI issues.	v charts				0	0	0	0	0
24	1.05	2	2	1.4	Ensure HSI implications, constraints & issues are addressed and included in the ICD.	A&S Toolkit				0	0	0	0	0
25		2	2	1.5	Document traceability of HSI requirements/metrics in ICD, AoA, SEP,TDS input, RFP, draft CDD, and TES and draft LCMP.	AFI 63-101 Para. 3.79				0	0	0	0	0
26	1.13.1	2	2	1.5.1	Ensure AoA development process includes HSI issues from the ICD.	A&S Toolkit				0	0	0	0	0
27		2	2	1.5.2	Ensure AoA process includes HSI plan goals and objectives determined during Mission Task Analysis.					0	0	0	0	0
28	1.13.1	2	2	1.6	Consider how KPP/KSAs will include HSI input.	A&S Toolkit, AFI 63-101				0	0	0	0	0
29	1.13.1	2	2	1.7	Ensure HSI implications, constraints and issues are included in draft CDD.	A&S Toolkit				0	0	0	0	0
31	2.14	6	1	**Task 2**	**Document consideration of HSI-related risks during risk assessment / Risk Management.**	AFPAM63-128, AFI 63-101 Para 3.16.1	**Include consideration of HSI risks during operational assessment and program-level risk management.**			0	0	0	0	0

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LCMP Findings

- Along with the SEP, the LCMP can serve as vehicle to formalize and ensure the coordination, communication, and connectivity between the traditionally functional Air Force responsibilities such as manpower, personnel, training, and environment, safety, and occupational health
- The LCMP can serve as an HSI check point for the program. It can help the program manager (who is ultimately responsible for HSI throughout the lifecycle) ensure that the appropriate level of HSI planning is incorporated throughout the program
- HSI-related risks should be clearly identified, included among the other risks managed by the Program Manager, and documented in the LCMP

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Systems Engineering Plan

- **Document Purpose: The purpose of the Systems Engineering Plan (SEP) is to help programs develop their systems engineering approach, providing a firm and well-documented technical foundation for the program. The SEP is a living document in which periodic updates capture the program's current status and evolving systems engineering implementation and its relationship with the overall program management effort.**

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SEP Template Screen Shot

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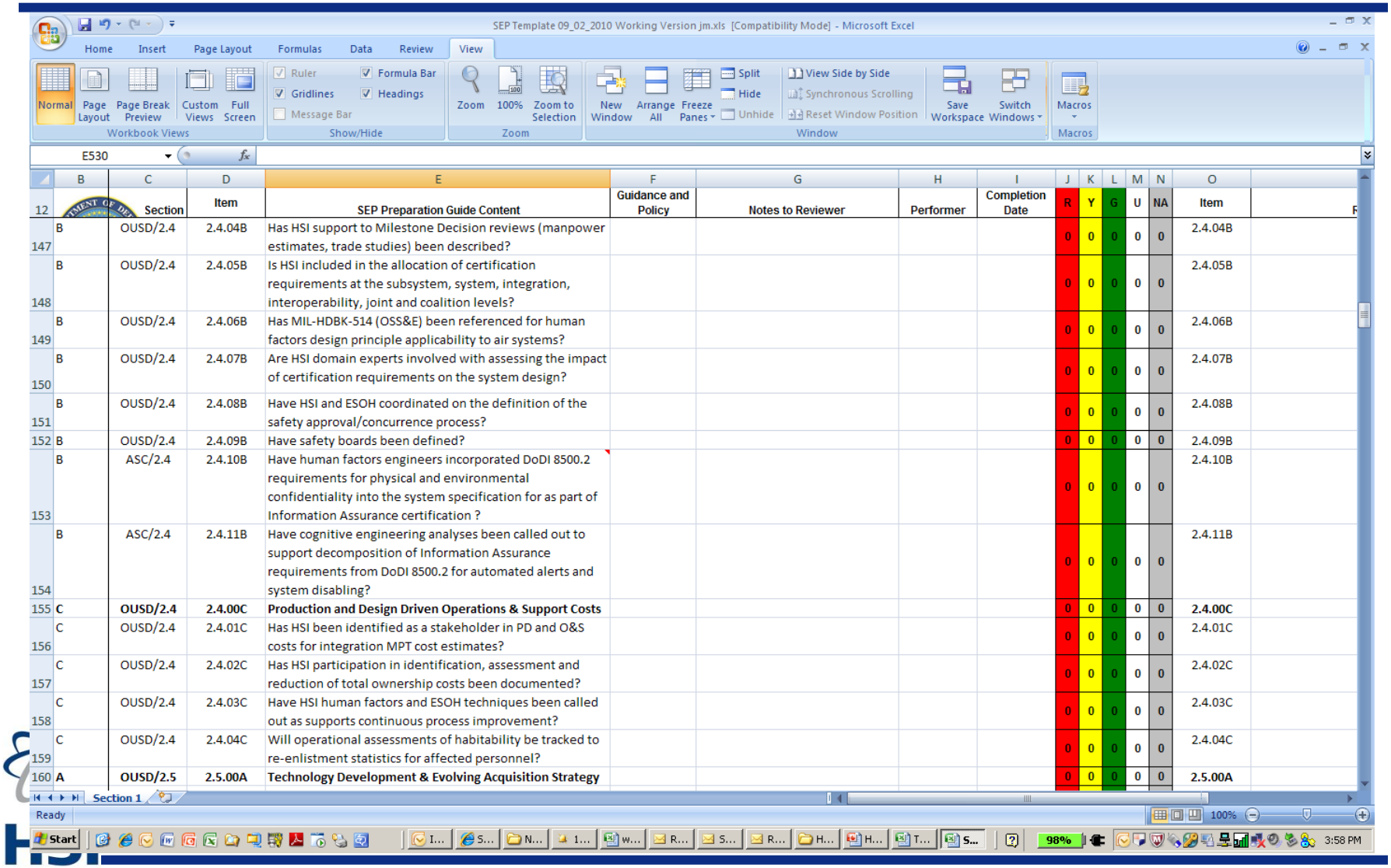

	B	C	D	E	F	G	H	I	J	K	L	M	N	O
12		Section	Item	SEP Preparation Guide Content	Guidance and Policy	Notes to Reviewer	Performer	Completion Date	R	Y	G	U	NA	Item
147	B	OUSD/2.4	2.4.04B	Has HSI support to Milestone Decision reviews (manpower estimates, trade studies) been described?					0	0	0	0	0	2.4.04B
148	B	OUSD/2.4	2.4.05B	Is HSI included in the allocation of certification requirements at the subsystem, system, integration, interoperability, joint and coalition levels?					0	0	0	0	0	2.4.05B
149	B	OUSD/2.4	2.4.06B	Has MIL-HDBK-514 (OSS&E) been referenced for human factors design principle applicability to air systems?					0	0	0	0	0	2.4.06B
150	B	OUSD/2.4	2.4.07B	Are HSI domain experts involved with assessing the impact of certification requirements on the system design?					0	0	0	0	0	2.4.07B
151	B	OUSD/2.4	2.4.08B	Have HSI and ESOH coordinated on the definition of the safety approval/concurrence process?					0	0	0	0	0	2.4.08B
152	B	OUSD/2.4	2.4.09B	Have safety boards been defined?					0	0	0	0	0	2.4.09B
153	B	ASC/2.4	2.4.10B	Have human factors engineers incorporated DoDI 8500.2 requirements for physical and environmental confidentiality into the system specification for as part of Information Assurance certification ?					0	0	0	0	0	2.4.10B
154	B	ASC/2.4	2.4.11B	Have cognitive engineering analyses been called out to support decomposition of Information Assurance requirements from DoDI 8500.2 for automated alerts and system disabling?					0	0	0	0	0	2.4.11B
155	**C**	**OUSD/2.4**	**2.4.00C**	**Production and Design Driven Operations & Support Costs**					0	0	0	0	0	**2.4.00C**
156	C	OUSD/2.4	2.4.01C	Has HSI been identified as a stakeholder in PD and O&S costs for integration MPT cost estimates?					0	0	0	0	0	2.4.01C
157	C	OUSD/2.4	2.4.02C	Has HSI participation in identification, assessment and reduction of total ownership costs been documented?					0	0	0	0	0	2.4.02C
158	C	OUSD/2.4	2.4.03C	Have HSI human factors and ESOH techniques been called out as supports continuous process improvement?					0	0	0	0	0	2.4.03C
159	C	OUSD/2.4	2.4.04C	Will operational assessments of habitability be tracked to re-enlistment statistics for affected personnel?					0	0	0	0	0	2.4.04C
160	**A**	**OUSD/2.5**	**2.5.00A**	**Technology Development & Evolving Acquisition Strategy**					0	0	0	0	0	**2.5.00A**

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SEP Findings

- **HSI needs to be integrated throughout the SEP. A separate HSI Plan or SEP HSI appendix will lead to suboptimal outcomes.**
- **The Chief Engineer's responsibilities should explicitly include HSI.**
- **The HSI IPT needs to be adequately staffed in accordance with the human considerations (situational awareness, decision making, physical demands, operating) of the capability being developed.**

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Test & Evaluation Strategy / Test & Evaluation Master Plan

- **Document Purpose: The Test and Evaluation Strategy (TES) describes the concept for tests and evaluations throughout the program life cycle, starting with Technology Development and continuing through Engineering and Manufacturing Development into Production and Deployment. It provides the basis for the Test and Evaluation Master Plan (TEMP). The TEMP describes the total test and evaluation planning from component development through operational test and evaluation into production and acceptance. It is an important document that identifies the required type and amount of test and evaluation events, along with their resource requirements.**

TES / TEMP Template Screen Shot

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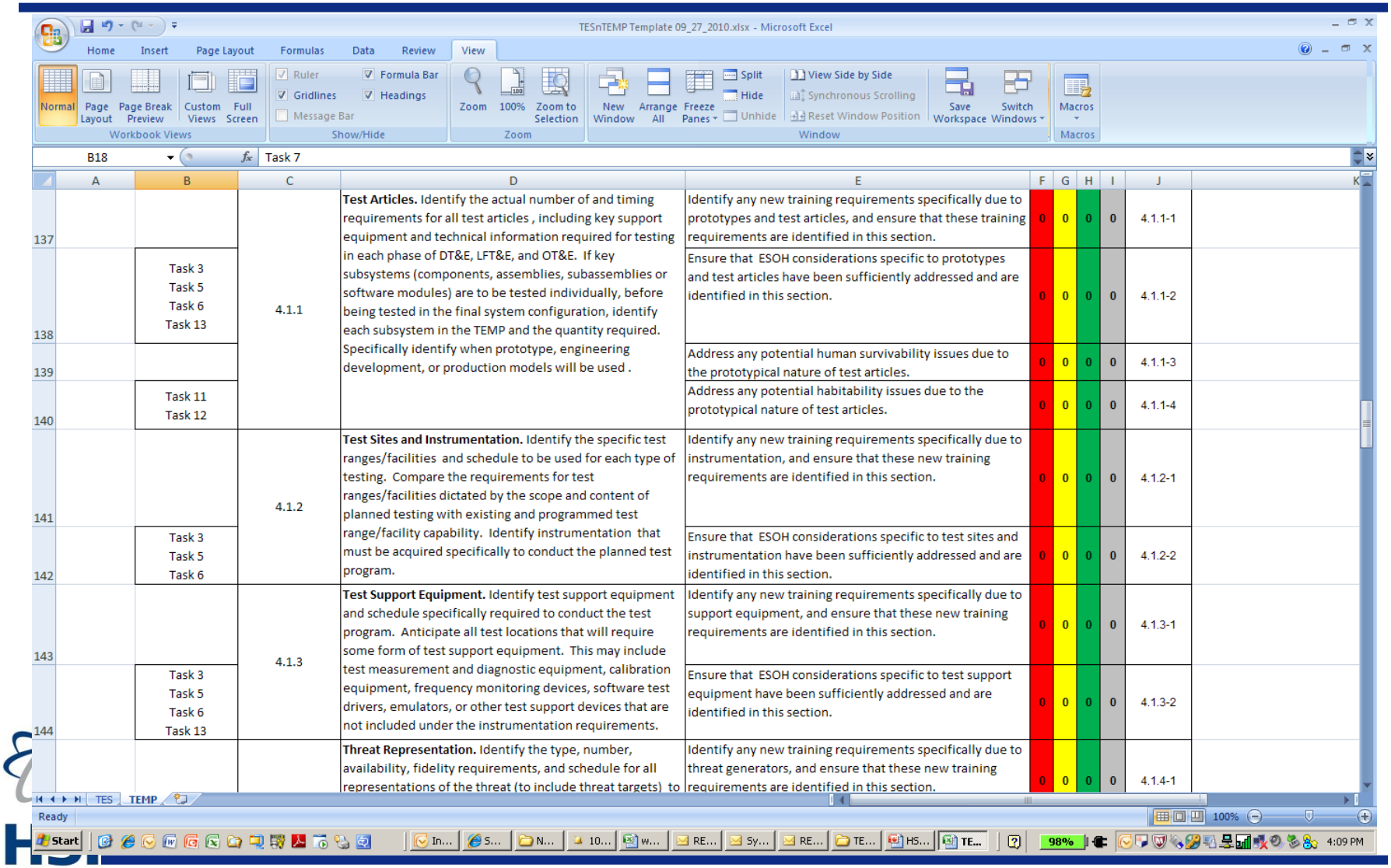

TESnTEMP Template 09_27_2010.xlsx - Microsoft Excel

Home | Insert | Page Layout | Formulas | Data | Review | View

Normal | Page Layout | Page Break Preview | Custom Views | Full Screen — Workbook Views

Ruler | Gridlines | Message Bar | Formula Bar | Headings — Show/Hide

Zoom | 100% | Zoom to Selection — Zoom

New Window | Arrange All | Freeze Panes | Split | Hide | Unhide | View Side by Side | Synchronous Scrolling | Reset Window Position | Save Workspace | Switch Windows — Window

Macros — Macros

B18 | Task 7

	A	B	C	D	E	F	G	H	I	J
137			4.1.1	**Test Articles.** Identify the actual number of and timing requirements for all test articles , including key support equipment and technical information required for testing in each phase of DT&E, LFT&E, and OT&E. If key subsystems (components, assemblies, subassemblies or software modules) are to be tested individually, before being tested in the final system configuration, identify each subsystem in the TEMP and the quantity required. Specifically identify when prototype, engineering development, or production models will be used .	Identify any new training requirements specifically due to prototypes and test articles, and ensure that these training requirements are identified in this section.	0	0	0	0	4.1.1-1
138		Task 3 Task 5 Task 6 Task 13			Ensure that ESOH considerations specific to prototypes and test articles have been sufficiently addressed and are identified in this section.	0	0	0	0	4.1.1-2
139					Address any potential human survivability issues due to the prototypical nature of test articles.	0	0	0	0	4.1.1-3
140		Task 11 Task 12			Address any potential habitability issues due to the prototypical nature of test articles.	0	0	0	0	4.1.1-4
141			4.1.2	**Test Sites and Instrumentation.** Identify the specific test ranges/facilities and schedule to be used for each type of testing. Compare the requirements for test ranges/facilities dictated by the scope and content of planned testing with existing and programmed test range/facility capability. Identify instrumentation that must be acquired specifically to conduct the planned test program.	Identify any new training requirements specifically due to instrumentation, and ensure that these new training requirements are identified in this section.	0	0	0	0	4.1.2-1
142		Task 3 Task 5 Task 6			Ensure that ESOH considerations specific to test sites and instrumentation have been sufficiently addressed and are identified in this section.	0	0	0	0	4.1.2-2
143			4.1.3	**Test Support Equipment.** Identify test support equipment and schedule specifically required to conduct the test program. Anticipate all test locations that will require some form of test support equipment. This may include test measurement and diagnostic equipment, calibration equipment, frequency monitoring devices, software test drivers, emulators, or other test support devices that are not included under the instrumentation requirements.	Identify any new training requirements specifically due to support equipment, and ensure that these new training requirements are identified in this section.	0	0	0	0	4.1.3-1
144		Task 3 Task 5 Task 6 Task 13			Ensure that ESOH considerations specific to test support equipment have been sufficiently addressed and are identified in this section.	0	0	0	0	4.1.3-2
				Threat Representation. Identify the type, number, availability, fidelity requirements, and schedule for all representations of the threat (to include threat targets) to	Identify any new training requirements specifically due to threat generators, and ensure that these new training requirements are identified in this section.	0	0	0	0	4.1.4-1

TES | TEMP

Ready

Start | 98% | 4:09 PM

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TES / TEMP Findings

- Air Force Test and Evaluation is sub-specialized by acquisition phase and product domain, making it difficult to uniformly integrate HSI into T&E.
- It is difficult, but not impossible, to write credible quantitative requirements and specifications that relate to a capability's human elements.
- T&E Personnel are familiar with methods and techniques for measuring human-related parameters, but requirements need to be in place.
- The T&E Framework provides an excellent opportunity to integrate HSI.

Top-Level Evaluation Framework Matrix
(DAG, Chapter 9 Notional Example)

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Key Requirements and T&E Measures				Test Methodologies/Key Resources (M&S, SIL, MF, ISTF, HITL, OAR)	Decision Supported
Key Reqs	**COIs**	**Key MOEs/ MOSs**	**CTPs & Threshold**		
KPP#1:	**COI #1.** Is the XXX effective for…	**MOE 1.1.**	Engine thrust	Chamber measurement Observation of performance profiles OAR	PDR CDR
	COI #2. Is the XXX suitable for…		Data upload time	Component level replication Stress and Spike testing in SIL	PDR CDR
	COI #3. Can the XXX be…	**MOS 2.1.**			MS-C FRP
		MOE 1.3.			Post-CDR FRP
		MOE 1.4.	Reliability based on growth curve	Component level stress testing Sample performance on growth curve Sample performance with M&S augmentation	PDR CDR MS-C
KPP #2		**MOS 2.4.**	Data link		MS-C SR
KPP #3	**COI #4.** Is training….	**MOE 1.2.**		Observation and Survey	MS-C FRP
KSA #3.a	**COI #5.** Documentation	**MOS 2.5.**			MS-C FRP

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Closing Comments

- The effort to inculcate HSI guidance throughout acquisition processes will help to increase HSI awareness
- The templates are a new concept
  - They need refinement to make them more user-friendly
  - They need proof testing with program office subject matter experts before they can be used universally

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Final Questions?

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